

Original Article

Climate adaptation monitoring frameworks: Challenges, best practices, needs

Frameworks de monitoramento da adaptação climática: Desafios, melhores práticas, necessidades

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Abstract

Climate change poses significant challenges globally, with certain regions being disproportionately affected. This article highlights the urgent need for effective monitoring and evaluation (M&E) systems to address climate change adaptation, using the African context as a case study. It emphasizes the importance of understanding the unique challenges of different realities and identifies best practices and areas for improvement. The paper consists of three main sections: an introduction to climate vulnerability in Africa and current policies, a literature review on M&E in climate change adaptation, and a comparative analysis of national frameworks in South Africa and Mozambique. The analysis reveals strengths, weaknesses, and different approaches to M&E, emphasizing accountability, learning, inter-sectoral coordination, and evidence-based policymaking and recommendations for enhancing M&E systems. Calling for monitoring and evaluation systems for climate adaptation that are flexible and context-specific to address challenges effectively.

Keywords: Monitoring and evaluation. Climate adaptation. Africa.

Resumo

As mudanças climáticas apresentam desafios em todo o mundo, com certas regiões sendo afetadas de forma desproporcional. Este artigo destaca a necessidade urgente de sistemas eficazes de avaliação e monitoramento (A&M) para abordar a adaptação às mudanças climáticas, utilizando o contexto africano como estudo de caso. Enfatiza a importância de compreender os desafios de diferentes realidades e identifica melhores práticas e melhorias. O artigo consiste em três seções: uma introdução à vulnerabilidade climática na África e às políticas atuais, uma revisão da literatura sobre A&M para adaptação e uma análise comparativa de estruturas da África do Sul e Moçambique. A análise revela forças, fraquezas e diferentes abordagens para A&M, enfatizando a *accountability*, aprendizado, coordenação intersetorial e formulação de políticas baseada em evidências, e recomendações para aprimorar os sistemas de A&M. Recomendando o estabelecimento de sistemas de A&M flexíveis e específicos, para abordar os desafios da adaptação climática de forma eficaz.

Palavras-chave: Avaliação e monitoramento. Adaptação climática. África.

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Introduction

Climate change is an ever-increasing concern globally as we are starting to push the limits of the planet, with impacts that both humans and nature will no longer be able to adapt to, and with some irreversible losses (IPCC, 2022). Those impacts, however, are not equally spread among regions, and some of them have been disproportionately affected by climate change, nominally it is possible to see the high levels of vulnerability to climate change in West-, Central- and East Africa – regardless of its low Greenhouse gases (GHG) emissions, and emissions per capita (IPCC, 2023).

As a “vulnerability hot spot” impacts on the African continent are expected to comprehend droughts, floods, heat waves, sea-level rise along most African coasts, agricultural and fishery productivity retractions, and impacts on human health associated with extreme weather among others (UNEP, 2013). Despite the pressing need for policies and projects that address climate change adaptation, current funding efforts lack strategic targeting toward adaptation activities, therefore, more focused, and sustained efforts are required to ensure that financial commitments translate into practical and meaningful changes for vulnerable African communities (Savvidou, 2021).

The vulnerability of African nations to climate change impacts has prompted a growing need for climate adaptation policies and adaptation finance. In this context, the importance of effective Monitoring and Evaluation (M&E) systems cannot be overstated. M&E systems play a crucial role in facilitating learning among decision-makers and communities, by providing insight into effective and ineffective adaptation strategies (ISSD, 2019). It is therefore imperative to examine how M&E for climate adaptation is being developed within the African context, and how well these systems are equipped to address the unique challenges and realities of the continent. This paper aims to shed light on what is the current state of M&E practices for climate change adaptation in Africa, with a focus on identifying best practices, challenges, and areas for improvement.

In order to address the question of monitoring and evaluating climate change adaptation in Africa, this paper is structured into three main parts and a conclusion. The first part provides an introduction to the context of climate vulnerability in Africa, including an overview of the policies being implemented to address it. The second part consists of a literature review on monitoring and evaluation in climate change adaptation, with a focus on key papers and methodological approaches. Finally, the third part presents a comparative analysis of two national frameworks: “The National Climate Change Response Monitoring and Evaluation System Framework” of South Africa and the “National Climate Change Monitoring and Evaluation System (SNMAMC)” of Mozambique.

By examining the strengths, weaknesses, and best practices of these frameworks and analyzing the literature on the topic this paper aims to provide a more comprehensive understanding of the challenges and opportunities associated with monitoring and evaluating climate change adaptation in Africa. Drawing on the insights gained from the literature review and comparative analysis, the conclusion will offer recommendations for improving current M&E systems in the region, highlighting areas for further research and development. In this way, the paper seeks to contribute to the ongoing efforts to address climate vulnerability in Africa and promote sustainable development across the continent.

Africa: climate vulnerability and adaptation

Adaptation is a term used to describe the modifications that ecological, social, and economic systems undergo as a result of actual or anticipated climatic stimuli and their associated effects (UNFCCC, 2023), implying alterations in the manner in which processes, practices, and structures are executed in order to mitigate potential harm or to capitalize on prospects associated with climate change.

As already previously mentioned, Africa is a “vulnerability hot-spot” with regard to climate change (UNEP, 2013), that way it is worth spending a few lines to briefly describe some of



those vulnerabilities and bring some figures about the current and historic scenario that the region faces about climate adaptation. The African Continent has some of the most affected countries by climate change, this is due to a mix of several factors, but it is possible to highlight a few of them, as its geographical location, presents one of the greatest effects of climate change (as flooding, drought, or other extreme weather events); the low levels of adaptive capacity, including among others public infrastructure and government effectiveness; and also the highly vulnerable and poor populations that reside in the country (Busby et al., 2013; UNEP, 2013; Hope Sr, 2009).

This scenario brings severe impacts in the African context in different sectors, even threatening Africa's ability to maintain sustainable growth and development, with the potential to not only hinder but also reverse the progress that has been made in enhancing the continent's socio-economic welfare over the past years (IPCC, 2022; Davis-Reddy & Vincent, 2017; Hope Sr, 2009). The impacts vary from impacts on sea level rises, rural-urban migration, health, migration between countries, biodiversity, agriculture, education, and the overall economy among others (IPCC, 2022; Ziervogel et al., 2014; Hope Sr, 2009), and is worth developing a picture of some of them.

As far as agriculture and food security are concerned, it will be likely for the sectors to suffer as a result of the more frequent flooding and droughts predicted for the region (Ziervogel et al., 2014). This is particularly concerning given that a significant portion of the African population relies on agriculture for their livelihoods and that agriculture constitutes one of the largest economic activities in the region, and as a result of the scarcity of resources caused by these climate changes, food prices are expected to rise, posing a significant risk of hunger and child malnutrition for many people across African countries (IPCC, 2022; Hope Sr, 2009).

Another sector deeply related to climate adaptation and vulnerabilities is human health, the African continent presently faces significant susceptibility to climate-sensitive diseases, and it is projected that alterations in temperature and rainfall patterns, brought about by climatic change, will exacerbate the incidence of vector-borne diseases such as malaria (UNEP, 2013; Hope Sr, 2009). But more than that, the increasing temperatures, aligned with the low social determinants of health observed in a vast part of the continent high incidence of direct heat-related morbidity & mortality, mental health issues as more cases of suicide and anxiety, and poor pregnancy outcomes (IPCC, 2022, 2023).

It is worth noting that the vulnerability of numerous African countries to climate-sensitive risks is compounded by their limited financial capacity to undertake adaptation measures and is expected to increase as the predictions for adaptation costs in Africa are around the tens of billions of dollars per year by 2050 (Savvidou et al, 2021; Davis-Reddy & Vincent, 2017). However, the funding for adaptation projects is still behind the numbers for mitigation projects - with adaptation representing just 33% of total expenditures (Savvidou et al, 2021). And on top of that, climate adaptation flows are not being strategically targeted either in terms of sectors, as almost all of the flows go to agriculture or water supply and sanitation not assessing the vast complexity of the issue presented, and also in geographical terms, as the flows don't target the most vulnerable countries (Savvidou et al, 2021; Davis-Reddy & Vincent, 2017; Busby et al, 2013), furthermore, Ford et al. (2015) in an analysis of series of documents constated negligible consideration of vulnerable groups adaptation programs, policies, and initiatives.

Even though we see a great level of heterogeneity among countries in the continent, both in terms of vulnerability, climate hazards, and investments for adaptation (IPCC, 2022, 2023; Savvidou et al, 2021; Davis-Reddy & Vincent, 2017; Busby et al., 2013), and an increasing effort to tackle climate adaptation (Ford et al, 2015), financial constraints and high vulnerability levels still poses a significant obstacle for most of the continent (even if with deferent degrees) in terms of their ability to build resilience to the impacts of climate change, and may leave them unable to fully adapt – reality also present in many countries from the global south (see for example Ngcamu (2023) or Ford et al. (2015)).

Both countries highlighted here are part of what is known as the Southern African Development Community (SADC), sharing common elements of vulnerability concerning the climate crisis. Noteworthy among these vulnerabilities are aspects related to food security and agricultural



production. Mutengwa et al. (2023) assert that Southern African countries are highly vulnerable to climate change, this vulnerability stems from their dependence on climate-sensitive crop production systems, coupled with challenges such as diminishing soil productivity, land degradation, a depleting natural resource base, weakened local institutions, traditional social safety-net systems, insufficient and declining capital resources, delayed access to crop production markets, and a notable prevalence of HIV/AIDS, malaria, and other diseases.

This vulnerability is reflected in data presented by Scholes et al. (2023), indicating that undernourishment in the region increased from 4.9% to 8.4% between 2005 and 2019 (approximately affecting 5.6 million people) and is projected to reach 14.6% by 2030. Similarly, research suggests a potential 35% decrease in wheat productivity across the Southern African region by 2050 under low mitigation.

In different sectors, Scholes et al. (2023) underscores that climate change poses a dual threat to water security in Southern Africa. Firstly, the anticipated reduction in rainfall and increased evapotranspiration due to rising temperatures may lead to diminished streamflow and dam yields. Secondly, elevated temperatures, reduced flows, and reservoir stock levels are expected to result in deteriorating water quality.

Furthermore, in health and the economy, it is estimated that by 2030, working hours lost to heat stress will be equivalent to 18,000 full-time jobs across Southern Africa, 12,000 more than 1995 - consequences of rising temperatures indicate declines exceeding 50% in GDP per capita across Southern Africa by 2100, relative to a world without climate change (Scholes et al., 2023).

In the case of South Africa, vulnerability to climate change is pronounced due to water and food insecurity, as well as potential impacts on health, human settlements, infrastructure, critical ecosystem services, and the nation's heavy reliance on rain-fed agriculture and natural resources. The country also grapples with high levels of poverty, particularly in rural areas, and exhibits a low adaptive capacity (World Bank, 2021).

In Mozambique, about one-third of the population resides in coastal zones, exposing low-lying settlements, associated developments, and fishing activities to severe flooding, sea-level rise, and related stresses. Rising temperatures and potential declines in rainfall pose threats to Mozambique's water resources, impacting households, industry, and agriculture. The implications extend to both the economy and food security, with agriculture, a sector employing the majority of the workforce, being highly vulnerable. Given the significant proportion of Mozambicans living below the poverty line, the majority of the population has limited capacity to adapt to increased extreme temperatures and the gradual, cascading impacts of climate change on the economy (AFDB, 2018).

As a result, these countries are left in a precarious position, and year after year stated as the most vulnerable ones, or the "vulnerability hot-spot" as they may be unable to adequately protect their populations from the increasing incidence of climate-sensitive challenges. This poses an important role in monitoring and evaluation systems to address accountability, and learning mechanisms to promote the just and rapid transition needed in the region.

Monitoring and evaluation in the context of climate change adaptation

As stated by the IPCC (2023, p. 75):

Sustained adaptation actions are strengthened by mainstreaming adaptation into institutional budget and policy planning cycles, statutory planning, **monitoring and evaluation frameworks** and into recovery efforts from disaster events (*high confidence*).

It is undeniable the importance that monitoring and evaluation frameworks have for climate change adaptation policies and projects, going from impacts on learning, accountability, transparency, better resources allocation, etc. (IPCC, 2023; Ssekamatte, 2018; Vallejo, 2017; Bours et al., 2013, 2014). Nevertheless, it is still not a very common practice, and considering the complexity of the subject we do not have an answer on what should consist of the best



practices regarding possible monitoring and evaluation frameworks for climate change adaptation.

Regarding the fact the former, the importance of monitoring and evaluation for climate adaptation was already acknowledged by almost half of the Nationally Determined Contributions (NDC) of all Parties of the UNFCCC, but until 2017 as put by Vallejo (2017) just a few countries implemented and/or were designing an adaptation monitoring and evaluation systems at the national level, with more frameworks being adopted for specific projects and policies. Some of the oldest ones were implemented by Finland and France in 2005 and 2007 respectively, but we also have some cases in Africa, Morocco (2009), Kenya (2012), Mozambique (2012), and the oldest one among all countries listed by Vallejo (2017) South Africa (2004) – in this paper we will analyze the South African one, as the oldest and one of the more recent ones, the Mozambique one.

As far as the contributions that the literature has on how these frameworks should be shaped, there are a lot of different opinions, and views that are evolving with time, for example, early indicators, during the 90s, tried to comprehend and emphasize “inputs” as finance commitments, pressure from different stakeholders made the measure focus now much more on “outcomes” and “impacts” (Hallegatte & Engle, 2019). However, before bringing up some methods and recommendations, it is first important to understand the challenges that monitoring and evaluation frameworks for climate change adaptation bring (even when compared to climate mitigation).

Challenges for monitoring and evaluation frameworks for climate adaptation

Many understand that adaptation interventions can be understood as “complex”, here in opposition to the simple or complicated design elaborated by Patton (2010), that is, exists a series of important uncertainties relationship between inputs and outcomes of the climate adaptation interventions (Fisher et al., 2015; Dinshaw et al., 2014). The source of this uncertainty relies upon a wide range of factors, analyzing the specialized literature six of them stand out as follows (understanding that some of the factors are intrinsically correlated).

The first factor is the long timeframes involved in those interventions, as the impact of climate adaptation interventions might not be clear for many years making it difficult to define and measure achievements – both because of the time that the intervention itself can take but also due to the fact that its achievements will only be seen as the climate change impacts become clear with time (Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2014; Bours et al., 2013). The second factor is the uncertainty about actual climate change patterns and their effects on a local scale because even if climate change will trigger severe adverse events globally, it is unclear how and when changes will unfold and what their consequences will be locally (IPCC, 2022; Bours et al., 2014; Bours et al., 2013), additionally, we may add that some places are likely to be affected indirectly, being even more difficult to access this “how and when”.

The third factor is related to collecting baseline data and changing contexts, as one of the important steps for the “normal” approach to development programs evaluation is the collection of baseline data against which progress can be measured. However, the comparison of pre-and post-intervention data presents a low degree of validity, as climate change is unpredictable, and today there still exist several gaps in climate change information systems, and designers would hardly be able to plan long-term outcomes (Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2013, 2014).

The fourth factor is the inappropriateness of universal indicators, as adaptation must be grounded in the context, scale, sector, and nature of the intervention, all of which vary widely, especially when compared to mitigation interventions – which can use more “simple” indicators as reduction of Greenhouse gases emissions (Hallegatte & Engle, 2019; Vallejo, 2017; Bours et al., 2013, 2014). Closely related to the previous, the fifth factor is the wide diversity of definitions and terms in climate adaptation interventions, and even within big institutions there is huge overlaps and duplication of those key terms, and some of the nuances are not widely understood, leading to intentional and unintentional misunderstandings (Hallegatte & Engle, 2019; Bours et al., 2013, 2014).



Finally, the sixth factor is how to assess attribution, as the intervention is embedded in complex, multi-sectoral nature, with varying scales, and long timeframes it is difficult to draw a counterfactual, making it difficult to demonstrate how the policy or program contributes to an overall adaptation process shaped by external factors. Furthermore, on the same topic, the outcomes might be seen just by measuring non-events, as particular adverse weather may not occur during the program cycle (Hallegatte & Engle, 2019; Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2013, 2014).

Recommendations for monitoring and evaluation frameworks for climate adaptation

Adaptation interventions are critical in reducing the vulnerability of communities to climate change impacts. However, as above mentioned, evaluating the impact of these climate adaptation interventions presents a significant challenge due to the complexity of the systems they operate in and the uncertainties associated with climate change. In order to overcome some of the above-mentioned challenges, both practitioners and scholars looked to other development interventions that have complex designs and challenges to draw various recommendations, and some of them will be briefly presented here.

One of the biggest challenges that underlie some of the factors mentioned in the previous section is the fact that counterfactuals are not available, and in some cases, it may be challenging to establish a counterfactual due to the complexity of the climate change context – even if one tries to opt to use a quasi-experimental design for the evaluations. In such situations, interventions design that map system dynamics and emergent change, while looking for patterns that can be identified through retrospective observations, may be useful for learning (Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2014). Furthermore, as Bours et al. (2014) argue, it might also be more meaningful to examine the contribution of an intervention to the observed outcome rather than to look for direct causal attribution, in a way that a proper counterfactual is not indeed needed. In that way, what is recommended is a deeper understanding of the mechanisms that lead to the outcome through the theory of change, those being crucial in establishing these contributions (Fisher et al., 2015; Dinshaw et al., 2014).

Furthermore, since attribution for adaptation monitoring and evaluation becomes even more of a challenge when programs are implemented over many years, assessing the contribution also would help to overcome some of the challenges that the long timeframes bring, as see the contribution to change may be more feasible and useful than establishing direct causal attribution (Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2014). To achieve it, Dinshaw et al. (2014) underlie the importance not only of evaluation for learning and accountability but also the role that monitoring and periodic data collection over the long-term duration have to determine success.

It is also deeply emphasized by several authors (Hallegatte & Engle, 2019; Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2014) that regarding the long timeframes, there is not just one right moment for evaluating long-term interventions (like ex-post evaluations), and forward planning is needed to support continuous learning and adjustment during implementation and set the stage for later evaluation. This highlights as mentioned the need for monitoring, but also the flexibility for adjustments of the theory of change based on learning and as contexts change and influence outcomes.

Moreover, this flexibility should also allow us to address the challenge of collecting baseline data and changing contexts. As techniques such as normalization and contextualization can be used for comparisons in the context of a shifting baseline for adaptation that need to take into account the changing external context and the interaction with project outcomes (Dinshaw et al., 2014; Bours et al., 2014). Also, Dinshaw et al. (2014) also emphasize that in the absence of relevant climate change data, other techniques such as projection and trend extrapolation methods can be used to estimate baselines from past and current trends.

With the scope of the baseline solved, authors such as Dinshaw et al. (2014) and Bours et al. (2014) also recommended that monitoring and evaluation for adaptation interventions should factor in sequential short-term targeting to measure long-term performance and use historical data for scenario-based target setting, as exact links between immediate outputs and longer-



term outcomes and impacts are not fully understood. And Hallegatte & Engle (2019) and Fisher et al. (2015) also bring some considerations regarding the use of process-based metrics that focus on the quality of a project's design and implementation, avoiding pitfalls associated with aggregated universal resilience indicators and should be considered a viable alternative.

In more general terms, other recommendations were also made with regard to the need for countries better communicate the results of the monitoring and evaluations conducted, and give visibility to it (Ssekamatte, 2018; Vallejo, 2017). The importance of effective partnerships and the enhance the use of Information and Communication Technology in the monitoring and evaluations (Ssekamatte, 2018). Or the need for aggregating information horizontally across climate-sensitive sectors, as well as vertically across different levels of government (Vallejo, 2017).

Summing up, almost all of the different views, emphasized the need for monitoring and evaluation systems for climate adaptation interventions, both for learning and accountability purposes. And to contend with the challenges of evaluating adaptation projects, evaluators need to move beyond employing specific monitoring and evaluation methodologies to address questions, instead, they should use mixed methods, including or adopting participatory approaches, and incorporate learning into the ongoing monitoring and evolving design of an intervention. Regardless of what specific methodologies and designs were suggested, all the authors analyzed in this section underline that the effectiveness of adaptation interventions in reducing vulnerability to climate change will depend on the robustness of the M&E frameworks used to evaluate emissions (IPCC, 2023; Hallegatte & Engle, 2019; ISSD, 2019; Ssekamatte, 2018; Vallejo, 2017; Fisher et al., 2015; Dinshaw et al., 2014; Bours et al., 2013, 2014).

National frameworks – the case of South Africa and Mozambique

In this section two national monitoring and evaluation systems will be briefly presented and analyzed in light of what was discussed in the previous sections of this paper. The systems are "The National Climate Change Response Monitoring and Evaluation System Framework" from the Republic of South Africa (RSA), and the "National Climate Change Monitoring and Evaluation System" (from the Portuguese "*Sistema Nacional de Monitoria e Avaliação das Mudanças Climáticas (SNMAMC)*") from the Republic of Mozambique (RM), the choice was made based on availability of information, as few countries in the world already have one national framework (Vallejo, 2017). It is important to notice that both frameworks are dealing with the broad aspect of climate change (both mitigation and adaptation policies), but this paper will only be focusing on the adaptation part.

The National Climate Change response monitoring and evaluation system framework

In a broader sense them just the analysis made here, regarding adaptation, RSA (2015, p. 48) states:

South Africa will build the climate resilience of the country, its economy and its people and manage the transition to a climate-resilient, equitable and internationally competitive lower-carbon economy and society in a manner that simultaneously addresses South Africa's overriding national priorities for sustainable development, job-creation, improved public and environmental health, poverty eradication, and social equality.

Having in mind this general objective, the national framework develops itself in two objectives, one of accountability, with a strong emphasis on compilation and communication of data and information both domestically and internationally, and the second, and the one that is most of the times reinforced during the framework, the objective of learning, or "generation of lessons" as put by the RSA (2015). It is worth noticing that to overcome the problem of wide diversity of definitions and terms, an analysis of definitions of the term's adaptation and resilience from several institutions as the UNFCCC, the UK Climate Impacts Programme, OECD, UNDP, IPCC, Global Environmental Facility, to come with a definition that will be adopted in the framework (also presenting a glossary with other key terms).

The framework is then developed in three building blocks: climate information (both observations and projections); monitoring climate risks, impacts and vulnerability; and adaptation response measures (Figure 1). The framework puts great emphasis on the role that monitoring will have in the context of the long-time frame interventions, similarly to part of the literature analyzed, however, even if recognizing that one of the roles of the monitoring system is to assess the changing vulnerabilities, more than considering the possibility of flexibility for adjustments, the framework relies to a great extent on the projections methodologies (RSA, 2015).

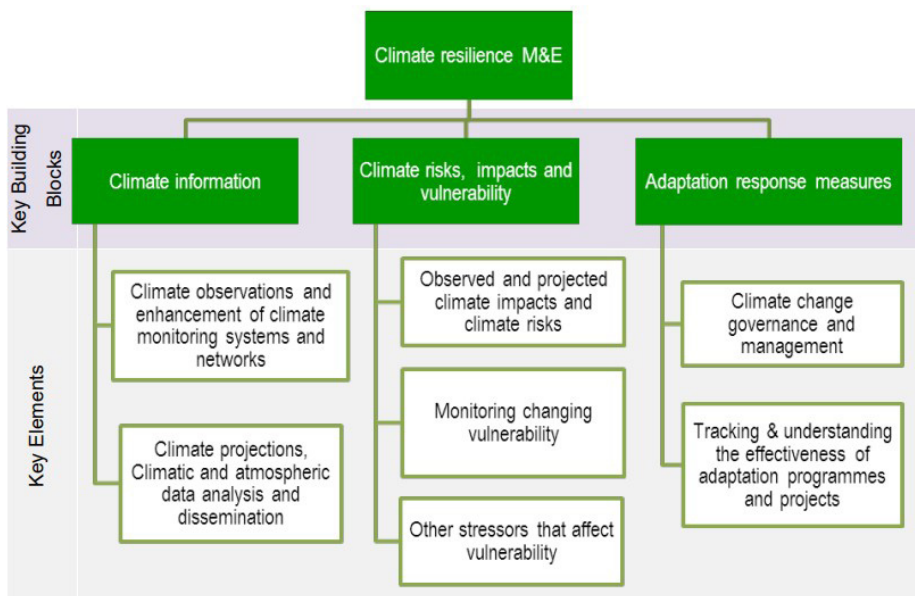


Figure 1. The key elements of Monitoring and Evaluation of climate resilience (RSA).

Source: RSA (2015).

Another two interesting features of the framework is the understanding that climate resilience or adaptation is a complex phenomenon that comprises a series of different subjects, such as poverty, inequalities, education, health, etc. And also different stakeholders, being possible to see an effort to horizontal and vertical integration by the design of Desired Adaptation Outcomes, which enables diverse stakeholders to collect information on the achievement of each outcome using different methods, but also by tracking “[...] the existence and strength of governance structures and processes that determine the readiness of Sector Departments, Provinces, Metros, Municipalities, State Owned Entities, Non-Governmental Organisations and business operations to build support for action” (RSA, 2015, p. 58).

It is also important to mention that adding to the general climate governance of the evaluation and monitoring framework, the Adaptation Evaluation Committee has been established to evaluate the effectiveness of the country's response to climate change adaptation measures - consisting of experts from various sectors, including public, private, civil society, and academia, and will prioritize the dissemination of knowledge. The committee's goal is to promote interdisciplinary capacities for responding to data-related issues and expert analysis of the responses (RSA, 2015).

National Climate Change Monitoring and Evaluation System

The National Monitoring and Evaluation System for Climate Change (SNMAMC) was designed to achieve various objectives related to climate change response, mitigation, adaptation and cross-cutting issues - with the last two being of greater importance for the government (RM, 2014). These objectives reflect the National Strategy for Adaptation to Climate Change (ENAMMC) and Sectoral Action Plans on Climate Change (PAMCs) through monitoring and learning from implementation processes, and were listed by RM (2014) as follows:



- i. Improve accountability in use of resources and verifying effective allocation for the sectors at all levels and for the most vulnerable groups;
 - ii. Support inter-sectoral coordination and the implementation of ENAMMC and Climate Change Action Plans (PAMCs) through monitoring and learning from the implementation process;
 - iii. Evaluate to what extent the ENAMMC has contributed to reduce vulnerability to Climate Change and attain Mozambique's national development goals despite the change of the country's climate regime.
1. Inform policymaking and planning by developing new evidence on effectiveness of adaptation, mitigation and Disaster Risk Reduction (DRR) approaches;
 2. Fulfill reporting requirements at national (Government) and international levels. (RM, 2014, p. 7)

The framework similar to the one of South Africa considers the engagement and horizontal and vertical integration of different stakeholders with a series of mechanisms for inter-institutional coordination. And addressing the complexity and context specificity of the climate adaptation interventions also reinforces the impossibility of standardized indicators, and the need to use the Theory of Changes for the monitoring and evaluation of the interventions (RM, 2014).

Furthermore, even with a great focus on the impacts and outcomes of the intervention, the framework also put equal importance on designing process-based metrics, looking to process and causes of vulnerability and adaptation, that as mentioned by the literature helps both with the problems of indicators, and the long-term periods (RM, 2014). It is also worth mentioning recognition of a great variety of possible methods, and mix of methods to conduct the evaluations, and the possibility of conducting it at different moments (RM, 2014).

Discussion and conclusion

The importance of monitoring and evaluation for climate adaptation is now widely accepted and has important implications for the outcomes and impacts of present and future interventions that are being made. However, those are complex interventions and with it, a series of challenges and possible problems might come especially considering the highly vulnerable and heterogenic context of the African continent regarding climate adaptation and resilience.

From the literature it was possible to see several recommendations on how to overcome these challenges, and when describing the two national frameworks it was possible to assess that the national monitoring and evaluation systems of South Africa and Mozambique are designed to achieve similar objectives related to climate change response, mitigation, adaptation, and cross-cutting issues, but have different approaches to achieve them – reflecting both the different contexts that the countries were, but also the impossibility of addressing the issue in a standardized way. The South African framework focuses more on accountability and learning through the compilation and communication of data and information, while the Mozambican framework prioritizes inter-sectoral coordination, policymaking, planning, and the development of new evidence on the effectiveness of adaptation, and resilience.

Both frameworks recognize the complexity and context specificity of climate adaptation interventions and engage different stakeholders. They also stress, with different degrees of intensity, the importance of horizontal and vertical integration, interdisciplinary capacities, the use of the Theory of Changes for the monitoring and evaluation of the interventions, and the need for monitoring and evaluation to assess the changing vulnerabilities and impacts of climate change.

When looking at the literature and comparing it to the case studies, it is important to notice that even if the frameworks did not use some of the specific tools or recommendations presented, several other alternatives were addressed to surpass the challenges discussed. However, neither frameworks use the idea presented in the literature of “flexibility” to overcome some



of the challenges that monitoring and evaluation for climate adaptation presents, which is possibly an area of further development in the national systems.

The conclusion of this study underscores the relevance of M&E for climate adaptation interventions, acknowledging its significance in reducing the vulnerability of communities to the impacts of climate change. In examining the challenges faced by M&E frameworks for climate adaptation, along with the recommendations drawn from the literature, crucial perspectives emerge for enhancing the implementation of these frameworks, particularly in vulnerable contexts such as African countries.

Taking into account the African reality, adopting a flexible approach in M&E frameworks is imperative, recognizing the complexity and heterogeneity of climate adaptation contexts on the continent. This flexibility involves the ability to adjust theories of change, indicators, and evaluation strategies as needed, considering the diversity of definitions and terms in the climate adaptation field. The implementation of M&E frameworks in the African context necessitates tailored approaches that address the unique challenges posed by the continent's diverse climates, economies, and social structures. Collaborative efforts among African nations, international organizations, and research institutions can play a pivotal role in developing region-specific best practices and fostering knowledge exchange.

As we draw conclusions from the case studies of South Africa and Mozambique, it becomes evident that recognizing the complexity and context specificity of climate adaptation interventions is critical, engaging different stakeholders, emphasizing the importance of horizontal and vertical integration, interdisciplinary capacities, and the use of the Theory of Change for monitoring and evaluation.

Even with some preliminary conclusions, a more systematic review of evaluations should also be done to assess how the frameworks are really being implemented, and if they are being able – as appear to be –, to face the challenges that the monitoring and evaluation systems face in the context of Africa and climate adaptation, but also see how these conclusions can be extrapolated to other contexts and realities around the world.

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References

- African Development Bank Group - AfDB. (2018). *Mozambique - National Climate Change Profile*. Retrieved in 2023, July 13, from <https://www.afdb.org/ar/documents/mozambique-national-climate-change-profile>
- Bours, Dennis, McGinn, Colleen, & Pringle, Patrick. (2013). *Monitoring & evaluation for climate change adaptation: A synthesis of tools, frameworks and approaches*. Retrieved in 2023, July 13, from <https://ora.ox.ac.uk/objects/uuid:8a5b5ca6-aeb6-494f-98e5-371f08659008>
- Bours, Dennis, McGinn, Colleen, & Pringle, Patrick. (2014). *Guidance note 1: Twelve reasons why climate change adaptation M&E is challenging*. Retrieved in 2023, July 13, from <https://ora.ox.ac.uk/objects/uuid:0c1c7961-bf82-43f3-a489-87ea59545a1a>
- Busby, Joshua W., Smith, Tood G., White, Kaiba L., & Strange, Shawn M. (2013). Climate change and insecurity: mapping vulnerability in Africa. *International Security*, 37(4), 132-172. http://dx.doi.org/10.1162/ISEC_a_00116
- Davis-Reddy, Claire L., & Vincent, Katharine. (2017). *Climate risk and vulnerability: a handbook for Southern Africa*. Pretoria: CSIR.
- Dinshaw, Ayesha, Fisher, Susannah, McGray, Heather, Rai, Neha, & Schaar, Johan. (2014). Monitoring and evaluation of climate change adaptation: methodological approaches. *OECD Environment Working Papers*, 12, 1-41. <https://dx.doi.org/10.1787/5jxrclr0ntjd-en>.
- Fisher, Susannah, Dinshaw, Ayesha, McGray, Heather, Rai, Neha, & Schaar, Johan. (2015). Evaluating climate change adaptation: learning from methods in international development. *New Directions for Evaluation*, 2015(147), 13-35. <http://dx.doi.org/10.1002/ev.20128>



- Ford, James D., Berrang-Ford, Lea, Bunce, Anna, McKay, Courtney, Irwin, Maya, & Pearce, Tristan. (2015). The status of climate change adaptation in Africa and Asia. *Regional Environmental Change*, 15(5), 801-814. <http://dx.doi.org/10.1007/s10113-014-0648-2>
- Hallegatte, Stephane, & Engle, Nathan L. (2019). The search for the perfect indicator: Reflections on monitoring and evaluation of resilience for improved climate risk management. *Climate Risk Management*, 23, 1-6. <http://dx.doi.org/10.1016/j.crm.2018.12.001>
- Hope Sr, Kempe Ronald. (2009). Climate change and poverty in Africa. *International Journal of Sustainable Development and World Ecology*, 16(6), 451-461. <http://dx.doi.org/10.1080/13504500903354424>
- Intergovernmental Panel on Climate Change - IPCC. (2022). *Climate change 2022: Impacts, Adaptation and Vulnerability*. Retrieved in 2023, July 13, from <https://www.ipcc.ch/report/ar6/wg2/>
- Intergovernmental Panel on Climate Change - IPCC. (2023). *Synthesis report of the IPCC sixth assessment report (AR6)*. Retrieved in 2023, July 13, from https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_LongerReport.pdf
- International Institute for Sustainable Development - ISSD. (2019). *Monitoring and Evaluation Systems for Adapting to Climate Change Are Only As Good As They Are Usable*. Retrieved in 2023, July 13, from <https://www.iisd.org/articles/measuring-evaluating-climate-change-adaptation>
- Mutengwa, Charles Samuel, Mnkeni, Pearson, & Kondwakwenda, Aleck. (2023). Climate-smart agriculture and food security in Southern Africa: A review of the vulnerability of smallholder agriculture and food security to climate change. *Sustainability (Basel)*, 15(4), 2882. <http://dx.doi.org/10.3390/su15042882>
- Ngcamu, Bethuel Sibongiseni. (2023). Climate change effects on vulnerable populations in the Global South: A systematic review. *Natural Hazards*, 118(2), 977-991. <http://dx.doi.org/10.1007/s11069-023-06070-2>
- Patton, M. (2010). *Developmental evaluation applying complexity concepts to enhance innovation and use*. New York: Guilford Press. Retrieved in 2023, July 13, from <https://www.betterevaluation.org/tools-resources/developmental-evaluation-applying-complexity-concepts-enhance-innovation-use>
- Republic of Mozambique - RM. (2014). *National Climate Change Monitoring and Evaluation System (SNMAMC)*. Retrieved in 2023, July 13, from <https://climatechangemoz.com/wp-content/uploads/2020/04/SistemaNacionaldeMonitoriaeAvaliacaodasMudancasClimaticas-Mozambique.pdf>
- Republic of South Africa - RSA. (2015). *The National Climate Change Response Monitoring and Evaluation System Framework*. Retrieved in 2023, July 13, from https://www.dffe.gov.za/sites/default/files/reports/nationalclimatechangeresponse_MESF.pdf
- Savvidou, G., Atteridge, Aaron, Omari-Motsumi, Kulthoum, & Trisos, Christopher H. (2021). Quantifying international public finance for climate change adaptation in Africa. *Climate Policy*, 21(8), 1020-1036. <http://dx.doi.org/10.1080/14693062.2021.1978053>
- Scholes, R. J., Coetzer, Kaera L., Matsika, Ruwadzano, Coetzee, Bernard W. T., Ernst, Yolandi, Etale, Anita, Kubanza, Nzalalemba Serge, Moyo, Khangelani, Nkrumah, Bright, Engelbrecht, Francois A., Simatele, Mulala Danny, & Vogel, Coleen H. (2023). A Delphi assessment of climate change risks in southern Africa in the 21st century. *Climate Risk Management*, 42, 100566. <http://dx.doi.org/10.1016/j.crm.2023.100566>
- Ssekamate, David. (2018). The role of monitoring and evaluation in climate change mitigation and adaptation interventions in developing countries. *African Evaluation Journal*, 6(1), 1-9. <http://dx.doi.org/10.4102/aej.v6i1.254>
- UN Environment Programme - UNEP. (2013). *Africa's adaptation gap climate-change impacts, adaptation challenges and costs for Africa*. Retrieved in 2023, July 13, from <https://wedocs.unep.org/rest/bitstreams/13879/retrieve>
- United Nations Framework Convention on Climate Change - UNFCCC. (2023). *Adaptation and Resilience*. Retrieved in 2023, July 13, from <https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction>
- Vallejo, Lola. (2017). *Insights from national adaptation monitoring and evaluation systems*. Retrieved in 2023, July 13, from <https://www.oecd-ilibrary.org/content/paper/da48ce17-en>
- World Bank. (2021). *Climate Risk Profile: South Africa (2021): The World Bank Group*. Retrieved in 2023, July 13, from https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15932-WB_South%20Africa%20Country%20Profile-WEB.pdf
- Ziervogel, Gina, New, Mark, Archer van Garderen, Emma, Midgley, Guy, Taylor, Anna, Hamann, Ralph, Stuart-Hill, Sabine, Myers, Jonny, & Warburton, Michele. (2014). Climate change impacts and adaptation in South Africa. *Wiley Interdisciplinary Reviews: Climate Change*, 5(5), 605-620. <http://dx.doi.org/10.1002/wcc.295>